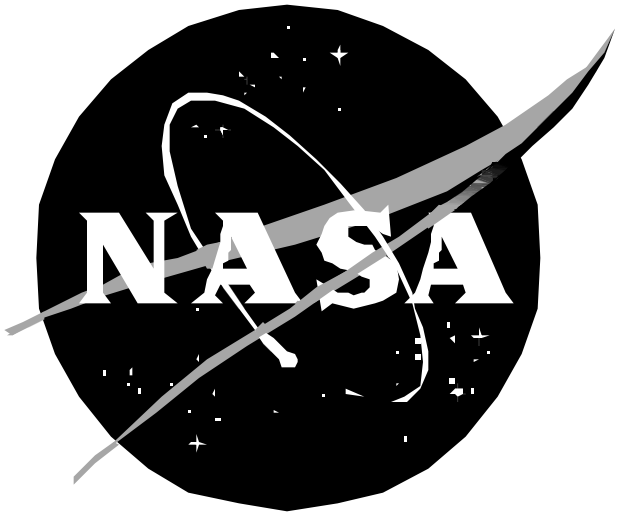

National Aeronautics and
Space Administration
Office of Equal Opportunity Programs
Minority University Research and Education Division

NRA-99-OEOP-01

RESEARCH ANNOUNCEMENT

FACULTY AWARDS FOR RESEARCH (FAR)

Release Date: June 12, 1998
Notice of Intent Due: July 14, 1998
Proposals Due: September 16, 1998
Selection Announcement: December 1998

INQUIRIES

General questions about this NASA Research Announcement may be directed to the NASA Minority University Research and Education Division staff by contacting the below individuals:

Mr. John Malone
Minority University Program Specialist
Code EU
NASA Headquarters
Washington, DC 20546

Telephone: (202) 358-0948
Fax: (202) 358-3745
Email: jmalone@hq.nasa.gov

or

Ms. Bettie L. White
Director, Minority University Research
and Education Division
Code EU
NASA Headquarters
Washington, DC 20546

Telephone: (202) 358-0970
Email: bwhite@hq.nasa.gov

NASA Research Announcement
Faculty Awards for Research (FAR)

This NASA Research Announcement (NRA) solicits basic and applied research and analysis from faculty of Historically Black Colleges and Universities (HBCU) and Other Minority Universities (OMU), including Hispanic-Serving Institutions (HSI) and Tribal Colleges, which are relevant to one or more of the four NASA Strategic Enterprises described in the NASA Strategic Plan and the associated research opportunities at the NASA Installations and/or the Jet Propulsion Laboratory (JPL) described in Appendix B of this document. The Strategic Enterprises are: Earth Science; Aeronautics and Space Transportation Technology; Human Exploration and Development of Space; and Space Science. These Strategic Enterprises encompass a broad range of traditional science and engineering disciplines to meet NASA's mission needs.

This solicitation is responsive to Federal mandates that require NASA to "...promote increased participation in Federal procurement by HBCU's and OMU's, including Hispanic-Serving Institutions (HSI) and Tribal Colleges (TC)."

Participation in this program is open to tenure and tenure-track faculty of HBCU's and OMU's, that offer degrees in engineering, mathematics, or science disciplines. Of particular interest to NASA is the involvement of faculty who are early in their "academic career." Approximately 20 awards will be made based on merit reviews. Each award will consist of a three year grant in support of the proposed research activities. NASA funding beyond the first year is based on an annual evaluation of documented progress, the availability of funds and the amount of funds reported in the Agency's Financial and Contractual Status (FACS) Report as unexpended at the end of each years period of performance. **Proposals are due by 4:30 pm (EST) September 16, 1998. Any proposals received after that time will not be accepted.**

Your interest and participation in this Minority University Research and Education Program and the Faculty Awards for Research Announcement are appreciated.

George E. Reese
Associate Administrator for
Equal Opportunity Programs

FACULTY AWARDS FOR RESEARCH

Faculty Awards for Research

I. Program Description

Overview

In response to a congressional mandate to increase diversity in the pool of Agency researchers, NASA's Office of Equal Opportunity Programs invites proposals for the NASA Faculty Awards for Research (FAR) Program.

During Fiscal Year (FY) 1999, approximately 20 proposals indicating research areas relevant to the NASA Strategic Enterprises will be selected from HBCU's and OMU's (which include HSI's and TC's) in science and engineering research fields. Universities should encourage outstanding and promising faculty early in the academic year, who have received a total of $250,000 or less in NASA research grants and NASA funding during the last 5 years, to submit a proposal.

Tenure and tenure-track faculty employed at eligible HBCU's and OMU's are invited to apply. Approximately 10 awards will be made to HBCU faculty and 10 awards to OMU faculty. Awards in support of the planned research activities will be made for up to 3 years based on an evaluation of documented progress, the availability of funds and the amount of funds reported in the Agency's Financial and Contractual Status (FACS) Report as unexpended at the end of the award's period of performance.

As a result of participating in this program, principal investigators will contribute directly to NASA research and support the development of the institution's undergraduate and graduate student researchers. Opportunities for participation in the Agency's mainstream research will expand as recipients' research capabilities are enhanced through interaction with NASA researchers and facilities. The student researchers will gain meaningful research experience by participating in the FAR program and their interest in pursuing advanced degrees in science, engineering and mathematics will increase. Furthermore, as the students graduate, the employment pool will increase for to represent all of Americas citizenry in the science, engineering, and technology fields.

Goals and Objectives

The goal of this program is to enhance cultural diversity in the NASA-sponsored research community by supporting faculty and students at HBCU's and OMU's while achieving NASA's mission.

Program objectives to accomplish this goal are as follows:

Identify outstanding and promising engineering, physical and life science tenure and tenure-track faculty early in their research careers as principal investigators who are capable of contributing to the Agency's research objectives and who have limited past NASA research grant experience.

Provide such faculty members with sufficient research support and exposure to the NASA peer review process to enable them to demonstrate creativity, productivity, and future promise in the transition toward achieving competitive awards in the Agency's mainstream research processes.

Support these investigators with resources to provide research experience in NASA-related fields to graduate and undergraduate students, who are US citizens, thereby increasing the pool from which NASA and the aerospace industry can draw.

Support and Commitment to the FAR Program

NASA

Approximately 20 awards will be made based on merit reviews. Each award will consist of a grant of no more than $100,000 per year for up to 3 years in support of the proposed research activities. A minimum of 25 percent of the NASA funds each year must go to support for US citizen graduate and undergraduate students involved with the research project. An additional 25 percent may be allocated to support an identifiable tenure or tenure-track faculty at an eligible community college as a research assistant. Continuation of funding for years two and three is predicated on documented progress reported annually and the availability of funds. Failure to make adequate progress in any one year will result in termination of the grant and continuation funding will not be provided. Further, continuation funding may be reduced if cost reporting indicates a significant level of unexpended funding.

Universities

Universities should clearly and succinctly identify any significant resources and support of their faculty principal investigators. Applicants who are principal investigators or co-investigators on other current or pending grants from NASA or other funding agencies should clearly identify such grants and explain in detail how the work and funding from the various sources will complement each other.

Principal Investigators

Principal investigators (PI) must maintain their status as full-time STET faculty members. The proposed research is to be conducted primarily at the university or at any institution or facility engaged in substantial NASA research.

Principal investigators must coordinate their research with a NASA Field Installation or JPL and must make at least one technical assistance visit to their sponsoring Installation / JPL during the first year of the grant and at least two visits over the three year period. They must also involve in their research either graduate or undergraduate students, who are US citizens. The students must account for 25 percent of the NASA funds and be identified and entered into the NASA student tracking system as part of the PI's annual report. The research funding may include support of research assistants, undergraduate student researchers, professional travel, research supplies and equipment, PI summer salary, and release time for conducting research.

II. General Information about the FAR Solicitation

Eligibility Requirements

Universities

All proposals must originate from U. S. colleges or universities that meet the following criteria. Proposing institutions must:

a. Offer degrees in engineering, mathematics or science disciplines **and**

b. Meet at least one of the following criteria:

Must be an accredited minority college or university with enrollment of a single underrepresented minority group or the combination of underrepresented minority groups that exceeds 50 percent of the total student enrollment as defined in the *Higher Education Act* as amended [see 20 USC 1135d-5 and 34 CFR 637.4(b)]; **and/or**

Must be designated by the Department of Education in as a Hispanic-Serving Institution (HSI) under Title III of the *Higher Education Act of 1965*, as amended [See 20 USC 1059 ©; Public Law 102-325, Section 316, July 22, 1992]; **and/or**

Must be designated by the Department of Education as a Historically Black College or University under Title III of the *Higher Education Act of 1965*, as amended (see 34 CFR 608.2); **and/or**

Tribal colleges and universities must be cited in Section 532 of the Equity in Educational Land-Grant Status October of 1994; Tribally Controlled Community College Assistance Act of 1978; or the Navajo Community College Assistance Act of 1978, Public Law 95-471.

Only Institutions that meet the above criteria can be the recipient of a NASA FAR grant. Any arrangements and / or agreements to have the administration of the award done by a third party is between the awardee and the third party and does not require NASA's involvement or approval.

Principal Investigators

Principal investigators must meet all of the following criteria at the time the proposal is submitted:

Must be a tenure or tenure-track faculty member of an eligible institution; and

Must have a Ph.D. in an engineering, mathematics or science discipline applicable to NASA research needs; and

Must be a US citizen; and

May not be a former and / or current FAR recipient; and

Received no more than $250,000 in NASA research awards during the last 5 years. (Applicants who are current / former principal investigators or co-investigators on NASA research awards must identify the amount of funding from such awards which support or have supported their part of the research).

NOTE: Co-Investigators are not permitted.

Solicitation Availability

A copy of the solicitation and the forms are available electronically via the Internet at the following address:

http://www.hq.nasa.gov/office/codee/mured.html

Schedule

NASA Research Announcement Released	June12, 1998
Notice of Intent Due	July 14, 1998
Proposals Due	September 16, 1998
Selection Announcement	December 1998

Contact for Questions

If you have any questions pertaining to this solicitation you may contact:

Mr. John E. Malone
NRA 99-OEOP-1
NASA Headquarters
Code EU
Washington, DC 20546-0001
Telephone: (202) 358-0948
Fax: (202) 358-3745
email: jmalone@hq.nasa.gov

III. Proposal Guidelines, Preparation Instructions, and Proposal Submission

Amendatory Guidelines Applicable to NRA 99-OEOP-1

General guidelines for proposal preparation are given in Appendix A, instruction for Responding to NASA Research Announcements. However, certain sections listed in Appendix A must be appropriately modified to meet the intent of the FAR program. For convenience, the following sections augment the descriptions in Appendix A.

A. Proposal Guidelines

1. If substantial collaborations with other institutions are intended, letters of endorsement must be submitted by the responsible individuals from those institutions in an appendix. Each endorsement letter should indicate agreement with the nature of the collaboration detailed in the proposal, which should be identified by title and date of submission.
2. All proposals must originate from a US university or college that meets the designated criteria and must reflect the unique combination of the applicant's interests and capabilities. The proposal should clearly identify the relevance of the research to NASA's mission. Written eligibility certification must be submitted for both the university and the PI. (See Form C-2)
3. The Length section of Appendix A (Section 9) is modified to require that the proposal's investigation description be limited to 10 pages. Reviewers will be instructed and obligated to review only the first 10 pages of the description.
4. A total of four copies, numbered 1 through 4, must be received by the appropriate NASA Installation or JPL by the deadline specified. A submitted proposal should be no more than 35 pages in length, using standard-sized paper (8.5x11), one-inch margins (top, bottom, left and right), and 12-point font. Certifications, appendices, forms, and figures, e.g., depicting research schedule, are desired but must fit within the 35-page limit. If a proposal is submitted printed double-sided, only 18 sheets of paper are acceptable, still totaling 35 printed pages. To facilitate the recycling of proposals after review, proposals should be submitted on plain, white paper only. The use of cardboard stock, plastic covers, colored paper, etc., is prohibited.

B. Budget Guidelines

The "Proposed Costs" discussed in Section 7.8 of Appendix A is supplemented by the following information concerning proposal cost detail.

1. The proposal should contain sufficient cost detail and supporting information to facilitate a speedy evaluation and award. Dollar amounts proposed with no explanation (e.g., Equipment: $5,000, or Labor: $23,000) may cause delays in funding should the proposal be selected. The proposed costing information should be sufficiently detailed to allow the Government to identify cost elements for evaluation purposes. Generally, the Government will evaluate costs in terms of their reasonableness and acceptability. Each category should be explained. Offerors should

exercise prudent judgment since the amount of detail necessary varies with the complexity of the proposal.

2. Direct labor costs should be separated by titles or disciplines such as Principal Investigator, clerical support, with percent of time. Please note, it is OEOP policy to not fund more than fifty percent of direct cost salaries. Estimates should include a basis of estimates such as currently paid rates or outstanding offers to prospective employees. Indirect costs should be explained to the extent that allows the Government to understand the basis of the estimates.
3. With regard to other costs, each significant category should be detailed, explained, and substantiated. For example, proposed equipment purchases should specify the type of equipment, number of units, and unit cost. Requested travel allowances should include the number of trips, duration of each trip, air fare, per diem, rental car expenses, etc.
4. Indirect costs are included in the $100,000.

C. Proposal Evaluation

Proposals will be evaluated on the five criteria listed below. They are listed in descending order of importance.

1. *Technical Soundness* Quality and approach of the proposed research, and its relevance to the NASA Installation or JPL research topic, overall project design, and thoroughness of research, evaluation and transition plans.
2. *Performance Competence* Qualifications of faculty principal investigator. Evidence of the researcher's skills, experience, and past accomplishments, and plan for participating in NASA mainstream research program.
3. *Research Experience* Degree to which the proposed research will meet the NASA objective to develop a pool of bachelors and graduate degree recipients, who are US citizens, with research experience in NASA-related fields.
4. *University Commitment* Evidence of adequacy of institutional resources available and university long-term commitment of resources, staffing, computer, equipment, and facilities.
5. *Cost* Appropriateness of the budget, including reasonableness of proposed cost and cost elements, cost-sharing, and 25 percent of the total budget allocated to students (no more than $15,000 per student per year).

NOTE: No award will be made to proposals that do not meet the 25% student support and the co-investigators requirements.

D. Selecting Your Designated Research Area

Applicants may propose to conduct research in an engineering or a science discipline that supports NASA's Strategic Enterprises and is related to NASA's mission. A list of such research opportunities that are relevant to the NASA Installations and the JPL are given in Appendix B. Please note that Langley Research Center will not be accepting proposals in response to this NRA.

A principal investigator may submit only one proposal but may submit it to more than one Installation or JPL for consideration. However, the selection of **only one research topic per Installation/JPL is allowed.** Please indicate the topic selection on the proposal cover page (Form C-1).

Discussions of proposed research with appropriate NASA Field Installation or JPL personnel before submission of a proposal to that Installation or JPL is strongly encouraged. A list of appropriate initial NASA Installation and JPL contacts is given below.

E. Contact List for technical and scientific inquiries:

Ames Research Center
Mr. Geoffrey Lee
(415) 604-6406
Fax: (415) 604-3869
glee@mail.arc.nasa.gov

Dryden Flight Research Center
Ms. Erma Cox
(805) 258-3033
Fax: (805) 258-2800
erma_cox@mail.dfrc.nasa.gov

Goddard Space Flight Center
Dr. Dillard Menchan
(301) 286-7348
Fax: (301) 286-0298
dmenchan@pop100.gsfc.nasa.gov

Jet Propulsion Laboratory
Richard Ashe
(818) 354-3014
Fax: (818) 393-4977
Richard.L.Ashe@cc2mhb.jpl.nasa.gov

Johnson Space Center
Lupita Armendariz
(281) 483-0604
Fax: (281) 483-0609

Kennedy Space Center
Evelyn Johnson
(407) 867-9834
Fax: (407) 867-1066

Lewis Research Center
Mr. Robert Lawrence
(216) 433-2921
Fax: (216) 433-5266
Robert.F.Lawrence@lerc.nasa.gov

Marshall Space Flight Center
Mr. Willie Love
(205) 544-0088
Fax: (205) 544-2411
Willie.Love@msfc.nasa.gov

Stennis Space Center
Dr. Armond Joyce
(601) 688-3830
Fax: (601) 688-7499
Armond.T.Joyce@ssc.nasa.gov.

F. Proposal Format, Content, and Page Limitation

The proposal should be submitted according to the order listed below and should not exceed 35 pages including certifications, forms, and appendices. Each proposal should adhere to the table guidelines for the maximum number of pages for that section.

	Proposal Requirements	Max. Pages	Comments
Transmittal Letters	1. Transmittal Letter	1	
	2. University Statement A description of the university's support and resource commitments.	1	
Required Forms	3. FAR Proposal Cover Page The proposal cover sheet must be signed by an institutional official who is authorized to certify institutional support and sponsorship of the investigation and of the management of the proposal.	1	Appendix C Form C-1
	4. Table of Contents	1	
	5. Certification of Institution and Faculty Eligibility Form	2	Appendix C Form C-2
	6. Supplementary Information Report Form (optional)	1	Appendix C Form C-3
	7. Certifications Regarding Lobbying, Debarment, Suspension and Other Responsibility Matters and Drug-Free Workplace Requirements Form **(This form does not have to be submitted with the proposal. The authorizing institutional signature on the Proposal Cover Page certifies that the proposing institution has read and is in compliance with these certifications)**		Appendix C Form C-4

	Proposal Requirements	Max. Pages	Comments
	8. Proposal Summary Form Include an abstract (200-300 words) of proposed research describing the objectives and method of approach. Include how the research relates to NASA interests and major accomplishments planned for the performance period.	2	Appendix C Form C-5
Project Description	9. Proposal Investigation Description Narrative should include the PIs research, evaluation, and transition plans. Plans should include objectives that are specific, measurable, achievable, and realistic within a stated time period. Include a detailed plan describing involvement in the research of socially and economically disadvantaged and disabled graduate and undergraduate students who are US citizens. Detail how these students will be tracked through completion of their degrees.	10	Appendix A Section 7.4
Qualifications	10. Principal Investigator Research Qualifications Submit proposers vitae, including academic record and listing of relevant publications. A single-page bibliography including no more than five publications relevant to the proposed research may be included as an appendix.	3	
Budget	11. FAR Budget Form and narrative Summary budget by year for each of the 3 years. A minimum of 25 percent of the total budget must directly support graduate and undergraduate students who are US citizens. No single student may receive more than $15,000 per year. Student support should be categorized under the "Other" section (2.f) of the Budget Form. Narrative	6	Appendix C Form C-6

	Proposal Requirements	Max. Pages	Comments
	Include explanatory notes for each line item in the budget. Funding limitation of $100,000 **includes** indirect costs.		
Appendices	· Endorsement Letters · Single-Page Bibliography		

Note: Proposal must not exceed 35 pages, including certifications, forms, and appendices.

G. Proposal Submission

To assist in expediting the evaluation, selection and award processes, prospective proposers are requested to submit a Notice of Intent (NOI) electronically, either on-line or by e-mail. The on-line form will be available 2 weeks after the solicitation release date and can be accessed at http://www.hq.nasa.gov/office/codee/mured.html. E-mail the following information to jmalone@hq.nasa.gov with FAR 99 NOI as the subject:

Research Code (Appendix B):
Institution:
PI Name:
PI Address:
PI Phone:
PI Fax:
PI e-mail:

Proposers are requested to submit the following forms (accessible at http://www.hq.nasa.gov/office/codee/mured.html.

Form C-1: Proposal Cover Page;
Form C-6: Proposal Summary Form; and
Form C-7: Budget Request Summary

These forms will be available for on-line data entry 45 days prior to the solicitation closing date. All proposals must be received at the appropriate NASA Installation or JPL **no later than 4:30 p.m. (local time), Wednesday, September 16, 1998**, to be considered for FY 1999 awards. Proposals received after this date and time are ineligible for consideration. This supersedes Section (G) of the instructions for responding to NASA research announcements listed in Appendix A. The proposals may be delivered by regular mail, certified mail, or commercial delivery. Avoid using registered mail, as this may delay the log-in time of arrival. To ensure identification of proposals by the mailrooms for proposals sent through regular US mail, please mark your proposal in an appropriate place with the following identifier in large bold letters: FAR PROPOSAL - NRA 99-OEOP-1. Receipt acknowledgment of proposals will be e-mailed within 14 calendar days of the proposals due date.

Number of copies to submit to both NASA Headquarters and the selected NASA Installation are listed below:

A. Headquarters

Two copies of the proposal must be sent to Mr. John Malone at the following address:

US Mail:
Mr. John E. Malone
NRA 99-OEOP-1
NASA Headquarters
Code EU
Washington, DC 20546-0001

Commercial delivery (e.g., Federal Express) or hand-carried to:

Mr. John E. Malone
NRA 99-OEOP-1
NASA Headquarters
Attn: Receiving and Inspection (rear of building)
Code EU
300 E Street, SW
Washington, DC 20546-3210

and;

B. NASA Field Installations and JPL

An original and three copies of the proposal must be sent to the appropriate NASA Field Installation or JPL that is responsible for the proposed topic area. (If you are submitting to more than one Installation, an original and three copies of the proposal must be sent to each site). The following is a list of mailing addresses for the NASA Installations/JPL.

Please note that Langley Research Center will not be participating in this year's FAR. Therefore, no proposals should be submitted to that center for consideration under this NRA.

Proposal Mailing Address For NASA Installations and JPL

Ames Research Center
Ames Research Center
c/o Mr. Geoffrey Lee
NRA 99-OEOP-1
Mail Stop 223-3
Building N 223, Room 113
Moffett Field, CA 94035-1000

Dryden Flight Research Center
Attn: Ms. Erma Cox/D-1030
Dryden Flight Research Center
NRA 99-OEOP-1
4876 Lily Drive
Edwards, CA 93523-00273

Goddard Space Flight Center
Attn: Ms. Gwennie Durrah
For Mr. Dillard Menchan
Goddard Space Flight Center
NRA 99-OEOP-1, Mailroom
Mail Code 239
Greenbelt, MD 20771

Jet Propulsion Laboratory
Mr. Richard Ashe, Jr.
Administrator, Minority Science
& Engineering Initiatives Office
Jet Propulsion Laboratory
NRA 99-OEOP-1, MS 72-109
4800 Oak Grove Drive
Pasadena, CA 91109

Johnson Space Center
Ms. Lupita Armendariz
Johnson Space Center
FAR Proposal, NRA 99-OEOP-1
2101 NASA Road One
Mail Code AJ
Houston, TX 77058-3696

Kennedy Space Center
Kennedy Space Center
NRA 99-OEOP-1
Mail Code OP-CIAO
Kennedy Space Center, FL 32899

Kennedy Space Center (cont'd)
For Commercial Delivery:
Attn: Ms. Ember Smith
NRA 99-OEOP-1
State Road 3 (Gate 2)
Building N6-1009
Kennedy Space Center, FL 32899

Lewis Research Center
Attn: Mr. Robert Lawrence
Lewis Research Center
NRA 99-OEOP-1
Mail Stop MS 3-16
21000 Brookpark Road
Cleveland, OH 44135

Marshall Space Flight Center
Attn: Ms. Marena McClure
Procurement Office
Marshall Space Flight Center
NRA 99-OEOP-1
Mail Code GP10
Marshall Space Flight Center, AL 35812

Stennis Space Center
Attn: Mr. Frank Oerting
Stennis Space Center
NASA Procurement Office
NRA 99-OEOP-1
Mail Code DA00
Stennis Space Center, MS 39529

IV. Notification

The NASA FAR program is highly competitive. By reading the entire solicitation document and then carefully following the instructions, you will avoid the problem of having your proposal disqualified for failure to meet basic requirements. NASA has no obligation to evaluate proposals that do not meet all stated requirements.

Proposals will go through a competitive review process. Selection announcements will be made in December 1998. Selection notification to the institution and the principal investigator will be in writing. The cover page signees will also be notified by e-mail.

The selection official for this solicitation is the Associate Administrator for Equal Opportunity Programs.

V. APPENDICES

Appendix A

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

(JANUARY 1997)

(a) General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR. Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) Transmittal Letter or Prefatory Material.

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information**. Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information

that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description**.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach**. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel**. The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs.**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(9) **Security**. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support**. For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify

the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals**.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals**. A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) **Evaluation Factors**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques**. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award**.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Cancellation of NRA**. NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

Appendix B

Description of FAR Research Opportunities

Ames Research Center (ARC)

Aerophysics **AR01**

Aerodynamics: applied aerodynamics, advanced aerodynamic concepts, aerodynamic facilities and operations. Computer systems and research: systems integration. Fluid Dynamics: computational aerosciences, computational algorithms and applications, turbulence and transition, modeling and experimental validation, fluid mechanics. Numerical Aerodynamic simulation Systems: applied research, systems development, computational programs.

Aerospace Systems **AR02**

Full-Scale Aerodynamics Research: fixed wing aerodynamics; rotorcraft mechanics; National Full-Scale Aerodynamics Complex (NFAC), the world's largest wind tunnel; data acquisition, systems and research operations. Information Sciences; artificial intelligence, computational systems, spacecraft data systems. Human Factor Research: computational human engineering; full-mission simulation, human interface research, rotorcraft human factors, flight human factors. Flight Systems and Simulation: air traffic control, field systems, flight dynamics and control; simulations experiments, aircraft systems, aircraft guidance and navigation, simulation systems.

Airborne Science and Applications **AR03**

Develop instruments and conduct airborne experiments in Earth systems science and airborne astronomy utilizing unique high altitude (ER-2) and medium altitude (DC-8, C-130, Learjet) airborne facilities for remote-sensing and in-situ Earth studies. Analyze and archive acquired airborne science data. Develop sensors and perform ground-based infrared astronomical observations and data reduction and analysis.

Ecosystem Science and Technology **AR04**

Interdisciplinary research which looks at the role of life in modulating the complex cycling of materials and energy throughout the biosphere. Intact ecosystems, with particular emphasis on temperate and tropical forests, are examined by remote-sensing from aircraft and spacecraft and by field site visits, with subsequent laboratory and computer analysis of the data gathered.

Flight Research **AR05**

Flight test, modification and maintenance of powered-lift aircraft and rotorcraft. Development and evaluation of ground-based flight simulators. Management and operation of aeronautical test range for research aircraft tracking and data analysis.

Space Research **AR06**

Life Sciences: gravitational biology, flight equipment engineering, science operations, payload operations. *Earth System Science:* ecosystem science and technology, atmospheric chemistry and dynamics, atmospheric physics. *Space Science:* observational astrophysics, laboratory astrophysics, planetary science, exobiology, star and planet formation, search for other planetary systems, planetary exploration.

Advanced Space Technology: extra-vehicular life support systems, regenerative life support systems, hypersonics, aerothermodynamics, computational chemistry, thermal protection systems, and facilities, infrared detector development, cryo-optics, systems

evaluation and integration. *Space Projects:* centrifuge facility project, gravitational biology project, stratospheric observatory for infrared astronomy project, Discovery project development, unpiloted research aircraft development, advanced mission studies.

NASA has designated Ames Research Center as the Center of Excellence for Information Technology (COE-IT), specifically, to pioneer and lead the research development, and implementation of information technologies to support NASA's Aeronautics and Space Enterprises and missions. Its five information technology focus areas are identified as follows:

Integrated Design Systems: Intelligent computational tools and modeling methods; System Integration tools and data bases; Infrastructure for collaborative computing; and, Immersive design environments.

Large-Scale Information Management and Simulation: Data archiving and dissemination; information discovery and utilization; and, Knowledge creation.

Aviation Operations: Information management; Intelligent decision support agents; Human factors; and Software engineering for ultrareliability.

Space Systems Operations: Automated fault/health management advisory tools; design/operations data bases; and telescience, remote presence, and virtual environment Interfaces.

Autonomous Systems for Space Flight: On-board fault detection, analysis, isolation, and recovery; Closed-loop event detection and response; and Management and control of Interacting heterogeneous Intelligent agents.

Dryden Flight Research Center (DFRC)

Flight Operations **DF01**

High speed/performance mission support, shuttle landing support, avionics, flight crew, aircraft life support, operations engineering, aircraft quality inspection, aircraft maintenance and modification, flight data acquisition systems, and mission control.

Research Engineering **DF02**

Fluid and flight mechanics, aerostructures, thermostructures, propulsion and performance, flight instrumentation, flight dynamics, flight controls and systems, structural dynamics, thermal and mechanical load control systems, ground test data acquisition systems, and sensor evaluations.

Research Facilities **DF03**

Information systems, range systems, flight simulation systems, integrated test systems, systems development, system integration and facilities engineering.

Goddard Space Flight Center (GSFC)

Space Sciences **GS01**

High energy astrophysics; X-ray and gamma-ray spectroscopy, cosmic ray physics; solar, stellar, galactic and metagalactic high energy processes; UV, optical, and infrared astronomy; theoretical astrophysics; cosmic background radiation; solar physics; radio galaxies; chemical history of solar system; solar wind; comets; planetary atmospheres, magnetospheres, meteoritic asteroids, radio wave and ion

plasma of planetary satellites; galactic, stellar, and planetary infrared spectroscopy; molecular aeronomy; extreme UV spectroscopy, planetary electric and magnetic fields.

Earth Sciences **GS02**

Earth system sciences integrates the search for understanding the way the Earth System works including interactions among the atmosphere, hydrosphere, biosphere, and the solid Earth. This involves numerical modeling of the atmosphere, ocean, and terrestrial systems; supporting observational studies on radiation, vegetation, tropospheric and stratospheric chemistry, ocean surface dynamics, sea ice, oceanic productivity, regional and micro-scale dynamics, cloud convection, cloud modeling and radiation balance, solar radiation studies, geophysics, plate tectonics, geomagnetism, gravity, celestial dynamics, and planetary atmospheres. Tools used to provide observations supporting these studies include remote-sensing, passive and active instruments including laser and radar altimetry, scatterometry and microwave sensors. Data interpretation methods include data assimilation into models. Field studies are also carried out, involving in-situ sensors, aircraft and satellite sensors.

Engineering Development **GS03**

Optical analysis, optical material research and optical metrology equipment development; thermal analysis including two-phase heat transfer, contamination effects and contamination transport mechanisms applied to advanced spacecraft and instrument systems for STS and free-flying spacecraft; cryogenic cooling development for space instruments; very large-scale integrated circuits using NMOS and CMOS; multi-chip module radiation-hardened processors, high density solid state memories, and fiber optic data networks, advanced electronic and photonic materials and microelectronic device fabrication; ultra-low noise microwave amplifier and mixer design and testing; correlated double sampling of infrared detector array data; advanced sensors and instruments for observation of x-ray, gamma-ray and ultraviolet radiation, images, and spectroscopy; electromechanical subsystem control, interactions, system modeling, and developing control laws for small self-contained instruments; vibration cancellation and isolation; analysis of the dynamics of large structures in orbit, flexible space structures, thermal effects, excitation by mechanisms or spacecraft control system; attitude dynamics and control of spinning/non-spinning flexible spacecraft and, dynamics and precision-pointing of instruments from zero momentum 3-axis controlled spacecraft.

Communications & Data Systems Development **GS04**

Expert systems/neural networks/model-based systems/agent-based systems for automated mission operations, resource scheduling, and system and network modeling and fault isolation; distributed systems for payload control and data handling; VLSI and gate array design for real-time telemetry processing; software engineering technology for decentralized development of large scale systems and development of a reusable software base; data management technology for distributed systems and data flow architectures for telemetry processing; human factors technology and rapid prototyping techniques for interactive spacecraft, network, data system control workstation design, and RF communications, modulation/coding, antennas, receivers, demodulators, and propagation effects.

Computational Sciences and Information Systems **GS05**

Simulations and modeling of Earth and space phenomena; high performance computing; global optimization algorithms and applications; simulated analogs; genetic algorithms; neural networks; intelligent data management systems; mass data storage systems, access and retrieval; scientific visualization and animation; voice recognition, data compression, optical systems characterization, image restoration, and on-board high performance data recorders.

Earth Sciences **GS06**

Earth system sciences integrates the search for understanding the way the Earth System works including interactions among the atmosphere, hydrosphere, biosphere, and the solid Earth. This involves numerical modeling of the atmosphere, ocean, and terrestrial systems; supporting observational studies on vegetation, tropospheric and stratospheric chemistry, ocean surface dynamics, sea ice, oceanic productivity, regional and micro-scale dynamics, cloud convection, cloud modeling and radiation balance, solar radiation studies, geophysics, plate tectonics, geomagnetism, gravity, celestial dynamics, and planetary atmospheres. Tools used to provide observations supporting these studies include remote-sensing passive and active instruments including laser instruments including laser and radar altimetry, scatterometry, and microwave sensors. Data interpretation methods include data assimilation into models. Field studies are also carried out, involving in-situ sensors, aircraft and satellite sensors.

Research Opportunities at Wallops Flight Facility **GS07**

Physical oceanography, laser remote-sensing applications, atmospheric chemistry, remote-sensing of atmospheric ozone, development of remote sensors, thin film material research, balloon membrane structural analysis, launch vehicle aero-ballistics, reentry, aero-thermal analysis, development of improved attitude control system(s), network and data systems control, thermodynamic modeling of large balloon structures, environmental impact of range operations.

Research Opportunities At Goddard Institute for Space Studies **GS08**

The Goddard Institute for Space Studies (GISS), located on the Columbia University campus in New York City, conducts comprehensive, theoretical and experimental research in: climate change, Earth observations, paleoclimatology, cloud climatology, radiation studies, hydrological studies, stratospheric dynamics biogeochemical cycles and planetary atmospheres including the dynamical meteorology of Mars. GISS is the Global Processing Center for the International Satellite Cloud Climatology project.

Jet Propulsion Laboratory (JPL)

Systems **JP01**

Systems analysis; policy analysis and operations research; design of space missions; spacecraft system design and concurrent engineering, integration; assembly, test and launch operations, navigation; spacecraft sequence design including robotics and artificial intelligence applications; mission operations systems; distributed real time information systems.

Earth and Space Sciences **JP02**

Emphasis on remote-sensing along with extensive efforts in data analysis and theoretical modeling, field measurements and laboratory research in related disciplines. Fields of interest are planetary atmospheres, planetary geology, planetary and interstellar astronomy, astrophysics, relativity and cosmology, interplanetary space physics, comet and asteroid studies, Earth atmosphere, atmospheric chemistry, global weather and climate, oceanography, geosciences, air-sea interaction, and air-land interaction.

Telecommunications Science and Engineering **JP03**

Emphasis on deep space and Earth satellite communications, radiometric tracking and active remote-sensing along with related science, technology, and engineering. Areas of current interest include: spacecraft communications systems, highly stable microwave transponders, low noise amplifiers, efficient antennas, source and channel coding, noise processes, signal processing, communication networks, ultra-precision frequency

standard systems, satellite-based mobile communication systems, high power Earth-based radar, spaceborne synthetic aperture radar, altimeters, meteorological radars, scatterometers, radar radiometrics, VLBI and GPS-based systems for navigation and tracking, geodynamics science and instrumentation, radio and optical interferometry.

Avionic Systems and Technology **JP04**

Advanced microelectronics including sensors, micromagnetic and superconducting devices, and microelectronic materials; in-situ microinstruments; analog processing devices, fuzzy logic, and neural networks; guidance and control analysis for advanced spacecraft including special topics information flight and tethered systems; sensor, actuator, and control development for spacecraft, a microspacecraft, and space structures; space interferometer technology; robotics, telerobotics, autonomous vehicles, and microrovers; telepresence and virtual reality; machine vision, photonics, including optical processing and electro-optics; machine intelligence and autonomous intelligent spacecraft, ground system, and mission operations technology; energy conversion, storage and management, including fuel cells, batteries, solar arrays, and thermal-to-electric converters, for spacecraft and terrestrial power systems; integrated microavionics technology and applications including concurrent, distributed processing, integrated power electronics, and advanced packaging; spacecraft data system technology including computer architecture, flight computers, data storage, and software.

Mechanical Systems Engineering and Research **JP05**

Active cooling of sensors, vibrational isolation of substructures, precision deployable space structures, precision inflatable structures, opto-electronic materials, dimensionally stable structures, smart structures and materials, active optics devices, electric propulsion, advanced chemical propulsion, cold electronics, advanced electronic packaging, low temperature physics, advanced chemical systems, miniaturized components, advanced instrumentation, environmental simulation.

Observational Systems **JP06**

Development of instrumentation systems employing X-ray, ultraviolet, visible and infrared imaging; infrared and visible spectroscopy; passive microwave radiometry; and analytical techniques. Development of calibration science technology to enable quantitative remote-sensing. Technology development and characterization of advanced sensors and focal plane arrays. Development of optical systems, interferometry, electro-optical systems, and optics technology. Development of science data processing systems including algorithms and systems architectures, image processing and science data analysis and visualization. Development of science data management systems and analyzing systems.

Information Systems Development and Operations **JP07**

Development, planning and operations related to ground-based information systems for spacecraft missions. Research areas include: advanced automation for spacecraft diagnosis; simulation and graphics for knowledge fusion, data understanding, and training; high-rate, high-capacity information systems; software productivity and reliability; intelligent access to large, interactive hypermedia data bases; high-performance computing and networking; numerical analysis and computational software libraries; and low-cost mission operations.

Space Microelectronics Technology **JP08**

This Center focuses upon the design and development of microelectronics and advanced computing unique to space applications. One focus involves the development of sensors for those portions on the electromagnetic spectrum that are not accessible from Earth

because of atmospheric absorption. Another focus is the development of microinstruments and microelectronics systems for miniature spacecraft. This center also develops high performance computing for mission data analysis and visualization.

Space Interferometry **JP09**

This Center focuses upon the development of leading edge capabilities in optical interferometric imaging and astrometric technology. This center will also enable the development of lightweight space telescopes, interferometers, and advanced detectors for the next generation of Astrophysics missions. By so doing, this center will enable JPL to conduct advanced science experiments in Extra-Solar System Exploration and in Astrophysics.

In-situ Exploration and Sample Return **JP10**

This Center intends to develop leading edge capabilities in domains central to in-situ and sample return missions to bodies within our solar system. Current emphasis is on experimental development of scientific instruments associated with sample acquisition and instrument deployment. These instruments will be used to explore atmospheres, surfaces and subsurfaces of solar bodies. The Center's work will enable JPL to carry out sample return missions to Mars and comet nuclei. This work will also enable in-situ missions to Europa, Titan, Venus and to the outer planets.

Integrated Space Microsystems **JP11**

The focus of this Center is the development of system architecture, core technology development, system level integration, and validation of breakthrough technologies for a complete avionics-on-a-chip that will integrate key spacecraft subsystems into a single unit. These subsystems include computers, telecommunications, navigation, power management, and sensor technologies.

Deep Space Communications and Navigation Systems **JP12**

Center is to develop concepts and technologies for communication and navigation associated with the next generation space exploration missions. Included in these concepts are communications between spacecraft, and with surface and subsurface platforms (e.g. rovers penetrators, hydrobots). Emphasis is placed upon the development of innovative concepts that involve instruments with low mass operating with low power while under extreme environmental conditions. This Center is also taking the lead for the development of the optical communication with, and navigation of , spacecraft and space instruments.

Space Mission Architecture and Design **JP13**

The focus of the Center is to develop the architectural concepts that will be used for the development of future mission. This involves modeling and simulations.

Johnson Space Center (JSC)

Engineering Directorate

Crew and Thermal Systems Division **JS01**

Research and technology development in the areas of biological and physical/chemical regenerative life support systems and active thermal control systems for crewed spacecraft and surface bases; extravehicular individual life support systems; space suit systems, and protective system concepts for dust exclusion from extravehicular system hardware components.

Tracking and Communications Division **JS02**

Design and analysis of space communication and tracking systems. Topics of interest include: infrared, laser/optical millimeter wave, microstrip patch antennas, multibeam arrays, multi-access, packetization, interference tolerance, channel coding, video compression, secure data, voice control, automated control and monitoring, and digital and Fourier optics vision.

Navigation, Control, and Aeronautics **JS03**

Design, development, integration, and testing of guidance, navigation, and control hardware and software systems for atmospheric and orbital flight; aerosciences engineering in the disciplines of flight dynamics, computational fluid dynamics, aerodynamics, and aerothermodynamics; application of Total Quality Management Tools to projects.

Flight Data Systems **JS04**

Study of flight data systems hardware and software that provides spacecraft computation and information processing, onboard check-out, instrumentation, data storage, and displays and controls. Includes applied technology studies for spacecraft data systems, instrumentation, signal conditioning, data recording, and advanced displays and controls.

Propulsion and Power **JS05**

Study of propellant chemistry and physics of combustion venting; fluid system leakage detection; cryo-coolers for long-term storage; high temperature rocket combustion chamber materials; propulsion/fluid system health monitoring; electric motors and controllers; zero/low gravity fluid management for Earth storable and cryogenic fluids; chemical reaction kinetics of pyro initiator explosions; evaluation of fuel cell polymer and intercalation-type electrodes; development of software system designs for distribution, control, and management of electrical power for space systems.

Automation and Robotics **JS06**

The study of the application of Artificial Intelligence (AI) and advanced automation technologies to the areas of: system and subsystem monitoring, control and diagnosis; automated assistance for systems operations; process planning and scheduling; advanced systems analysis and control; computer-aided engineering; concurrent engineering and intelligent integration of information; massively parallel and distributed computer processing; automated knowledge acquisition and machine learning; object-oriented data bases and data mining; graph theory and knowledge representation; human-computer interaction; engineering methods for intelligent systems; teleoperator, telerobotic, and autonomous robotics control system development; robotic sensing, perception, and world model updating; real-time simulation of manipulators; engineering and integration of manipulators and end-effectors into laboratory robots.

Structures and Mechanics **JS07**

Study of microcracking of composite materials; study of spacecraft re-entry thermal protection and on-orbit thermal control techniques modal, vibration, and acoustic testing; and methods for micro-g isolation of on-orbit experiments, advanced methods for use in structural response analysis, and advanced computational computer-aided engineering graphics techniques for structural and thermal analysis.

Systems Engineering **JS08**

Research and development in the area of flight mechanics; conceptual design and analysis of evolutionary and future systems for transportation; Earth orbit activities.

Information Systems Office

Advanced Information Systems Technology **JS09**

Opportunities exist for developing and evaluating advanced information systems technology in support of NASA institutional and mission operations. Current areas include research into heterogeneous digital libraries, virtual reality technologies, general purpose intelligent training systems, expert assistants, neural networks for machine learning, applications of pattern recognition and signal processing to system monitoring and process control, software development tools and methods, network technology, genetic algorithms, distributed computing technology, and knowledge/process capture technology.

Safety, Reliability, and Quality Assurance Office **JS10**

Develop strategies for expanding the current methodologies in risk assessment. Investigation, assessment, evaluation and initial feasibility development of automated failure tolerance analysis program, FMEA programs, fault-tree generation programs, and system safety analysis programs. Develop software product assurance methodologies for very large scale systems, expert systems and certified intelligence systems, including verification and compliance with product assurance requirements. Develop on-orbit systems maintainability technology such as calibration and pressure systems recertification. Develop application of existing nondestructive evaluation (NDE) technology for on-orbit systems including leak detection, composite materials, stress distribution, and surface impact detection. Develop technology and methodology for early detection of system failures, contamination, fires, and leaks.

Space and Life Sciences Directorate

Life Sciences Project Division **JS11**

Investigation, assessment, evaluation and initial feasibility development of biomedical instrumentation devices, systems, and supporting equipment for human experiments. Development of flight experiment hardware and supporting ground test equipment including definition, systems engineering and analysis, hardware fabrication and acceptance testing. Systems include sensing instruments, control, and data in support of in-flight biomedical monitoring of human status and performance. Areas of interest include flight experiment microcomputers; non-invasive physiological monitoring, respiratory gas analysis via mass spectrometry; data storage and recording; biomedical telemetry; auto test and checkout systems; ground support facility development and specialized support equipment.

Flight Crew Support Division **JS12**

Human-machine interface requirements definition, systems engineering, analyses and integration for development and operation of human-systems for space flight and planetary habitats. Areas of interest include Advanced Food Technology, flight crew equipment development and provisioning including clothing, restraints, mobility aids, personal hygiene, emergency survival techniques, housekeeping in reduced and microgravity, long mission systems development for clothes washing, personal hygiene, modified integrated logistics support techniques for small critical systems, advanced technologies for microgravity and 1-g human-machine interfaces; computerized dynamic, anthropometrically accurate, human-modeling; control of remote operations/human interfaces to automated systems; human-computer interaction research; system information management; habitability subsystems and protocols;

biomechanics data collection and human modeling advanced ADP technologies and applications, and high resolution digital image acquisition / storage / transmission / reproduction.

Medical Sciences Division **JS13**

Evaluation of bone demineralization, muscle atrophy, and cardiovascular deconditioning resulting from space flight; astronaut radiological health assessment; prevention of decompression sickness following pressure changes, biotechnology and cell culture in space; hormonal regulation of fluid and electrolyte balance; pharmacokinetics in space; nutritional biochemistry; muscle cell physiology; toxicological assessment of spacecraft environment; microbiological capability in space; physiological correlates of space adaptation syndrome; clinical characterization of space motion sickness (SMS); vestibulomotor and vestibulocular mechanism in SMS; behavioral, physiological and pharmacological countermeasures; development of capabilities for in-flight health care, physical exercise, and spacecraft environmental monitoring.

Earth Science and Solar Exploration Division **JS14**

Fundamental research on the composition, origin, and evolution of terrestrial planets, meteorites, and interplanetary dust through chemical, mineralogical, and isotopic analysis of extraterrestrial materials utilizing state-of-the art analytical instrumentation and through laboratory simulation of natural melting and impact processes using high-pressure, high-temperature furnaces and hypervelocity impact facility. Cooperative studies of energy expenditures in humans using mass spectrometers. Lunar base science and lunar and Mars resource utilization studies. Definition of future human planetary missions. Applied research into the characteristics of the near-Earth space environment, including measuring and modeling the distribution, rate of growth, hazards, and mitigation of debris in Earth orbit; hydrocode modeling of debris impact; experimental and hydrocode modeling studies of hypervelocity impacts onto spacecraft components; analysis of impacts on space-exposed surfaces; and measurement and modeling of the space radiation environment. Engineering analysis of photography and television of Shuttle and Space Station. Study of environmental, geological, oceanographic, meteorological processes as revealed in photography from Shuttle.

Space Station Program Office

Vehicle Office **JS15**

The EEE Parts Information Management System (EPIMS) is no longer the data base of choice since NASA HQ stopped development funds and the EPIMS Administrator is now supporting GSFC-funded data base developments and priorities. After coordinating with the EPIMS Administrator, it was agreed that the ISS Program Office should develop its own parts management system. GSFC is now developing a new Parts-Web data base which currently does not have all the capabilities to support the ISS EEE Parts need.

With the aid of the Summer Faculty Fellowship Program and support from the University of Houston, the Parts Control Board has developed a prototype data base in Microsoft Access which has been dubbed Polaris This system will be used in the short term to complete the launch package assessments. In addition, the EEE parts organization is working with the Engineering Data Management personnel to determine if VMBD capabilities can be developed to support long-term goals.

Kennedy Space Center (KSC)

Artificial Intelligence /Expert Systems **KS01**

The development of knowledge-based systems for a variety of ground processing and management functions. Specific interest exists in real-time control and monitoring, automated test procedure development, imbedded diagnostics, fault isolation, and management planning and scheduling applications.

Robotics **KS02**

The application of current and advanced robotics technology to time critical, hazardous or repetitive labor intensive operations. Specific interest exists in high-speed vision, precise positioning, force-torque tracking, counter balancing, adaptive control software, and redundancy. Application under study or development include: remotely controlled umbilicals; inspection and re-waterproofing of orbiter tiles; inspection of orbiter radiator panels; inspection of payloads; and cleaning of payload canisters.

Computer Science **KS03**

Research and development includes real-time systems for control and monitoring of complex check-out and launch procedures. Distributed data bases and computer networking techniques and various microprocessor applications in work and human-computer interface techniques are under investigation. Major efforts include the development processing systems specifically designed for use at KSC.

Communication/Fiber Optics **KS04**

Continued work with multi and single mode optical fibers exists as well as development activities in optical multiplexing, switching, repeaters, and various fiber optic instrumentation techniques. Applications for research also include high speed base band and broadband communications in the integrated networking environment and high reliability / redundant dedicated circuits.

Communications/Networks **KS05**

Research, development, and evaluation of leading edge network architectures, network operating systems, and network protocols. These would be for local area networks (LAN), metropolitan area networks (MAN), wide area networks (WAN) and the Internet. Focus study or analysis would include reduction of implementation and operating costs of existing systems, system expansions, and new systems. This is to be accomplished through the application of new technology, new techniques and consolidation of systems.

Instrumentation and Hazardous Gas Monitoring **KS06**

Numerous advanced technology projects include hydrazine sensing, mass spectrometry contamination monitors, personnel dosimeters, gas monitors and warning equipment for trace levels of several toxic elements. Other instrumentation projects involve level and flow measurement of cryogenic propellants, new transducers, and state-of-the-art fire detectors.

Fluids **KS07**

Tasks underway involve cryogenic vacuum-jacketed storage, perlite compaction, hypergol vapor dispersion down draft elimination, low-cost cryogenic transfer pipelines**,** high efficiency cryogenic insulation, cryogenic helium storage and transfer systems, slush hydrogen transfer pipelines, magnetic refrigeration for air conditioning, two-phase fluid flow meters, self-contained atmospheric protection ensemble breathing air management systems, hypergol discharge elimination, Computation Fluid Dynamics (CFD) of rocket exhaust into flame/exhaust ducts, and hypergol vapor scrubber improvement.

Computer-Aided Engineering **KS08**

Development of analytical and graphic techniques to improve engineering tasks associated with modeling and reporting results from analysis and laboratory tests dealing with dynamic loads, cryogenic two-phase flow and heat transfer, and structural, mechanical and electronic systems.

Atmospheric Science **KS09**

KSC is interested in predicting severe weather and thunderstorms. Instrumentation is in place and under development to track thunderstorms based on electromagnetic and electrostatic characteristics. Opportunities exist in studying the physics of lightning processes, in characterization of electromagnetic emission associated with lightning, and in the development and implementation of improved lightning protection techniques. Opportunities also exist for the development of operationally viable techniques for measuring (not merely inferring) charge and/or electric fields in and around clouds. Remote sensing techniques are preferred for operational reasons, but cost-effective in-situ measurements which do not interfere with or pose a hazard to launch operations would also be acceptable.

Life Sciences **KS10**

Continuation of a project to demonstrate the feasibility of using bioregenerative systems to recycle critical elements of human life support. Initial tasks employ a closed chamber to verify varieties of plants in communities for the production of edible biomass and respirable oxygen, and to recover water; and bioreactors to recover plant and human waste solids, fluids, and metabolic gases. Application of AI/Expert systems, robotics and instrumentation to this project is appropriate. Other allied research tasks deal with chemical and microbial contaminate characterization, removal, and control for habitable structures in the space environment; the influence that gravity may have on plant growth, metabolism, and production; and in the preservation of human health for long-duration missions.

Material Science **KS11**

A number of tasks are underway investigating corrosion preventative coatings to include electrically conducting polymers, accelerated corrosion test techniques, thermal protective coatings, material ignitability in high pressure oxygen, and cholorofluorocarbon replacement chemicals and mechanical cleaning techniques.

Industrial/Business Management **KS12**

Development models and measures for cost-effective application of information technology to shuttle processing.

Systems Safety **KS13**

Perform research in the identification and control of hazards, probabilistic risk assessment, fault-tree analysis and applications, interactive hazard information tracking and closure systems, and reliability engineering

Quality Engineering **KS14**

Perform research in the application of statistical process control, methods and analysis, automated assessment techniques and evaluation of inspection methods.

Flight Hardware Evaluation **KS15**

Activities would involve verification testing of space flight hardware in support of life sciences research in space. The hardware is to be evaluated as to providing an appropriate environment for the experimental organism within the mass, size and power constraints of a Space Shuttle middeck locker. The tasks involve ground-based biological verification of the appropriateness of the hardware as a research tool.

Life Sciences Educational Programs **KS16**

An evaluation of the Life Sciences Educational Programs is required to establish efficacy of the activities involved. A simple instrument and the means for compiling this data needs to be developed in which the participants in the event (students, teachers, and the public) can respond as to the impact of the event. The concerns-Based Adoption Model is an example of a model to measure the efficacy of teacher training. Creation of this evaluation scheme will include the development of instruments such as surveys, questionnaires, interview guidelines, and tests. The instruments must also be pilot-tested and evaluated as to their content validity and situational usefulness. Other tasks would be to develop curriculum enhancements to the current programs and improved means for coordinating and implementing existing programs.

Real Time Control Systems **KS17**

Research and development of hardware/software used in real-time control systems from embedded applications to critical large scale distributed systems. Applications under study or development include: control system for real-time digital video distribution system; control system for a checkout of space vehicles payloads; real-time voice communications systems; real-time monitor and analysis system for flight hardware technology demonstrator; development of rough logic algorithm for training of neural nets; development of RF collision detect wireless data network.

Industrial Engineering **KS18**

The developmental of industrial engineering technologies for supporting efforts to improve the efficiency and effectiveness of spacecraft processing. Areas of interest include: operations research, process simulation modeling, statistical process control, data mining, experimental design, advanced scheduling systems, project management risk analysis, cost benefit analysis, decision modeling, systems engineering, methods engineering, work measurement, human factors, ergonomics, facility layout/design, performance metrics, management information systems, and bench marking.

Lewis Research Center (LeRC)

Aeronautical Propulsion **LE01**

Rotorcraft, subsonic, supersonic, and hypersonic propulsion systems and components; aerodynamics and acoustics of turbomachinery; aerodynamics of inlets and nozzles; fundamentals of internal combustion; small engine propulsion technology; aircraft icing.

Propulsion Systems Analysis **LE02**

Propulsion system and aircraft modeling, integration analysis, novel concepts, mission studies, configuration studies, and environmental/economic assessments.

Computer Science **LE03**

Numerical analyses including nonlinear regression, acceleration of series or sequences of scalars and vectors, symbolic manipulation, modularized algorithms, client/server architectures, graphical user interface design and development.

Data Management **LE04**

Acquisition of experimental data, data base structure and searching, management information systems.

Instrumentation and Control **LE05**

Advanced instrumentation for propulsion research including thin-film sensors and remote-sensing optical-based systems, advanced propulsion and flight controls emphasizing integrated and fault-tolerant controls and fiber optic-based control systems, high temperature integrated electronics and sensors based on SiC technology.

Internal Fluid Mechanics and Heat Transfer **LE06**

Advanced numerical methods, multiblock grid and zonal approaches, 3-D geometry and mesh-generation techniques, prediction of 3-D turbulent flow fields, application of advanced computer concepts and expert systems, fluid mechanics of inlets and nozzles, aerothermodynamics of combustors and augmentors, fan and compressor aerodynamics, flow and heat transfer in turbines, unsteady aerodynamics.

Materials **LE07**

Metallic materials and advanced processing methods, ceramic and ceramic matrix composites, polymer and metal matrix composites, fundamental studies in tribology.

Microgravity Experiments **LE08**

Combustion, materials processing, crystal growth, fluid physics, theoretical modeling.

Space Communication **LE09**

Microwave amplifiers, solid-state devices, circuit technology, RF systems, digital systems, advanced antenna technology.

Space Power **LE10**

Photovoltaics, electrochemical energy storage, solar dynamic power systems, power electronic systems and devices, electrophysics, power management and distribution systems, power systems dynamics and control, environmental interactions.

Space Propulsion **LE11**

Primary and auxiliary chemical rockets; ion, resistojet and arcjet electronic propulsion; rocket engine health management, expendable launch vehicle upgrades.

Space Systems Engineering **LE12**

Space Station power system, advanced communication satellite (ACTS).

Structures **LE13**

Analysis and design methodology of metallic and composite engine structures, advanced structural mechanics, nondestructive evaluation, fatigue, fracture and life prediction, aeroelasticity and structural dynamics, rotor dynamics.

Marshall Space Flight Center (MSFC)

Space Sciences **MA01**

Gamma ray, x-ray astronomy, cosmic ray, low temperature, solar, atomic, magnetospheric, and space plasma physics; aeronomy; superconductivity.

Earth Science **MA02**

Storm physics; geophysical fluid dynamics; atmospheric processes, dynamics and composition; remote-sensing including laser Doppler and visible/infrared devices.

Computer Science **MA03**

Supercomputer systems optimization; distributed data management, Management Information Systems (MIS).

Microgravity Science **MA04**

Containerless processing, crystal growth, solidification phenomena, separation techniques, fluid modeling, protein crystal growth, optical techniques, solid-state structure and property characterization.

Materials and Processes **MA05**

Engineering physics, advanced NDE techniques, atomic oxygen effects, turbopump bearings, space lubricants, metallic materials, non-metallic materials, composites, propellants, processes engineering, robotics welding, welding process, vacuum plasma spray technology.

Structures **MA06**

Structural design optimization of isotropic and anisotropic space structures and elements, orbital (debris/meteoroid) protection systems, stress analyses, fracture mechanics, fatigue, durability, structural test methods.

Dynamics **MA07**

Rotordynamics, pointing and vehicular control systems design, large flexible space structures dynamics, vibroacoustics response, loads analyses, design criteria and verification methods, computational fluid dynamics, rarefied gas dynamics, fluid-elastic instabilities.

Propulsion **MA08**

Propulsion concepts for advanced space exploration, propulsion systems analysis, zero and low gravity fluid management, solid rocket motor technology development, hybrid propulsion technology development, combustion stability analysis, health management, reliability, turbo-machinery performance, cryogenic bearing design, engine ignition and transient analysis, combustion analysis, spray combustion experiments, combustion diagnostics, automated control systems, rocket engine testing, and digital/analog data acquisition systems.

Thermal Control and Life Support **MA09**

Closed loop life support analysis/integration/testing, heat pipes/two-phase flow analysis and modeling, avionics cooling, low temperature control/refrigeration development, passive thermal protection concepts and thermal vacuum testing techniques.

Information and Electronic Systems/Avionics **MA10**

Electrical systems, electrical power systems and components, solar power, high-rate and high-density data acquisition, audio and video systems, radio frequency and laser communication, lidar, antenna systems, flight computers and related ground support equipment, flight electronic packaging, life-cycle software engineering, math models, system and subsystem flight simulations, software development and management, fault tolerant logic systems, electronic device failure analysis techniques, optical instruments and systems, optical metrology, optical fabrication, and photographic processes.

Automation and Robotics **MA11**

Automation techniques (all Avionics disciplines), knowledge-based AI/Expert Systems development and implementation, robotics, telerobotics, and robotics system simulations.

System Analysis and Integration **MA12**

Systems engineering, systems analysis, systems design, integration/verification, orbital mechanics, optimization, trajectory optimization, mission design, guidance schemes, navigation methods, EMC/EMI analyses and modeling, Space Station support for lunar base/Mars mission, and configuration management techniques.

Systems Safety Engineering **MA13**

Hazard identification and control, probabilistic risk assessment, fault-tree analysis, interactive hazard information tracking. Automated assessment techniques, reliability engineering, statistical modeling, failure mode analysis.

Quality Engineering **MA14**

Application of quality function deployment, design of experiments for process characterization, program quality cost studies, application of statistical process control methods.

Testing and Experimentation **MA15**

Non-destructive evaluation of structures under dynamic loads, holographic and optical techniques, experimental astrophysics, vacuum system design.

Advanced Mission Studies **MA16**

Conceptual design of advanced launch and orbital vehicles, large optical systems, laser power beaming, geostationary facilities, crewed lunar and Mars missions, and scientific spacecraft.

Mission Operations **MA17**

Resource analysis, operations planning and integration, flight systems operations, data management, crew procedures, human/systems integration, mission design, ground control systems design, development and operation, communications systems, training systems design, development and operations, flight and ground crew training, human-systems development and development of analytical tools such as virtual reality.

Stennis Space Center (SSC)

Propulsion Systems Testing Techniques **ST01**

A flexible, dynamic fluid flow simulation and structural modeling graphic interface research tool is desirable for ground test programs of space propulsion systems. An effort is ongoing to develop an Engine Testing Facility Model which can run real-time prior to testing and during testing of an engine component.

Cryogenic Instrumentation **ST02**

Research, technology, and development opportunities exist in developing instruments to measure fluid properties at cryogenic conditions during ground testing of space propulsion systems. Instrumentation is needed to precisely measure mass flow of cryogens from very low flow rates to very high flow rates at pressures to 15,000 psia. Research technology and development opportunities also exist for instrumentation and methods of strain measurement at cryogenic temperatures.

Rocket Exhaust Plume Diagnosis **ST03**

Research opportunities are available to quantify failure and wear and related plume code validation through vehicle health management/exhaust plume diagnostics experimentation. Exploratory studies are being conducted with emission/absorption spectroscopy, absorption resonance spectroscopy, and laser induced fluorescence.

Non-Intrusive Remote-Sensing **ST04**

Future propulsion system test techniques could employ non-intrusive sensors for acquiring measurements over wide areas instead of the traditional contact, intrusive sensors at a few discrete points. Opportunities exist in temperature, pressure, stress, strain, position, vibration, shock, impact, and other measured test parameters. The use of thermal infrared, ultraviolet, and multi-spectral sensors, imagers, and instruments is possible through the SSC ground test technology laboratory.

Thermal Protection and Insulation Systems **ST05**

The test of liquid rocket systems employ very large flame buckets and diffusers to control, deflect, cool, condition, and reduce the sound level of the plume. Innovative thermal protection tiles, coating, or materials, and insulation systems could result in significant savings.

Leak Detection **ST06**

Opportunities exist in hazardous (e.g., hydrogen) and non-hazardous leak detection technology to determine what is leaking, how much is leaking, where is the source of the leak, and how to model and visualize the extent to the effected area.

Self-pumping, Supersonic **ST07**

Design methodologies, design tools, innovative designs, and/or operational techniques for self-pumping, supersonic diffusers for altitude testing of rocket engines are needed to reduce ground testing costs.

Earth Science **ST08**

Basic and applied research related to biological, chemical, geological, and physical processes occurring within the coastal environment (land and ocean)

and their interactions. Emphasis on the use of remotely-sensed data to examine relevant processes over a broad range of temporal and spatial scales as well as man's impact on the environment. Current research disciplines include archaeology, anthropology, botany, forestry, oceanography, plant physiology, and soil science. Tools include ground-based imaging spectrometers and airborne and satellite radiometers.

Remote-Sensing Technology **ST09**

The design and development of low-cost alternatives for multispectral imaging of Earth processes especially those related to coastal environments. Design and coding of innovative image processing tools related to Earth system science such as data visualization, archiving, and feature extraction.

Science Education **ST10**

The goal is to develop laboratory exercises and other curriculum support material that involves the incorporation of images acquired by earth-observing satellites into college-level science courses. Exercises will be computer-implemented and posted on a web site. Each lab exercise will integrate text, graphics, and images to focus on a science issue covered by the particular course for which one or two periods can be allocated..

Technology Transfer **ST11**

The design and development of marketing strategies to effectively promote and transfer a variety of technologies to the commercial sector. The design and development of methods / techniques to accurately capture economic impact of technology transfer initiatives.

Appendix C

Required Forms

FORM C-1

FAR Proposal Cover Page

This Box for NASA Use Only			
Proposal Number		Date Received	

Name of Submitting Institution : **Congressional District:**

Proposal Title:

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to NRA 99-OEOP-1, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the three Certifications contained in this NRA [namely, (I) *Certification Regarding Debarment, Suspension, and Other Responsibility Matters Primary Cover Transactions,* (ii) *Certification Regarding Lobbying,* and (iii) *Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Principal Investigator - Name	Authorized Institutional Official - Name
Title	Title
Department	Department
Mailing Address	Mailing Address
Telephone Number	Telephone Number
Fax Number	Fax Number
E-mail Address	E-mail Address
Principal Investigator - Signature	Authorized Institutional Official - Signature
Date	Date

Insert topic code associated with proposed research area (see Appendix A)

	Ames Research Center		Jet Propulsion Laboratory
	Goddard Space Flight Center		Dryden Flight Research Center
	Kennedy Space Center		Stennis Space Center
	Lewis Research Center		Johnson Space Center
			Marshall Space Flight Center

FORM C-2

FAR 1999

Certification of Institution and Principal Investigator Eligibility

Submit one copy of this form with the original proposal.
Do not include this form with any of the other copies, as this may compromise the confidentiality of the information.
Completion of this form is required.

I. Institutional Eligibility Certification

1. Institution Name _____
Proposal Title_____
_____

3. Identify Highest degree offered (e.g., MS, or Ph.D.) by the institution in Mathematics, Science or Engineering
Major_____Highest Degree_____
Major_____Highest Degree_____
Major_____Highest Degree_____

4. Check each of the Department of Education FY 1996 certifications held by the institution.
___ Minority Institution (underrepresented minority group(s) exceed 50% of the total student enrollment)
___ Designated Hispanic-Serving Institute
___ Designated Historically Black College or University

Note: Institutional eligibility will be verified by data on enrollments.

II. Principal Investigator Eligibility Certification

1. Last Name First Name MI

2. Verification of Employment:

Employed by (institution):

School/Department (specify):

Check type of position
___ Tenured ___ Tenured-track ___ Contractual

3. US Citizen ☐ Yes ☐ No (citizenship will be verified at award time)

4. Is Principal Investigator a recipient of a Ph.D. degree?
___ yes ___ no
If yes, specify area: engineering, mathematics, science

Certification Authority

The person authorized to sign below certifies that the information provided is accurate.

Authorized Institutional Official (typed)

Title

Authorized Institutional Official Signature

III. Previous NASA Funding

1. List all NASA awards, NASA contracts, NASA consulting from which the proposed PI received funding as PI or CO-I during the past 5 years, including active awards.

Column A	Column B	Column C	Column D	Column E
Award	**PI or CO-I**	**Title of Award**	**Period (from - to)**	**Amount**
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			/ / to / /	
			TOTAL FUNDING:	

Instructions:

Column A: Identify whether award was a research grant (R), education grant (E), contract (C), or consulting agreement (A).

Column B: For each award indicate whether applicant was a PI or CO-I.

Column C: List title of award.

Column D: List the period of performance**.**

Column E: List amount of award. For awards on which the proposed PI was a CO-I, show only that portion of the award which supported the proposed PI's personal research, and attach an explanation of how this was determined. For awards on which the proposed PI was the PI, show the total award amount.

FORM C-3

FAR 1999

Supplementary Information Report

Submit one copy of this form with the original proposal. Do not include this form with any of the other copies, as this may compromise the confidentiality of the information. Completion of this form is voluntary. Please check the appropriate answers to each question for the principal investigator. Any individual not wishing to provide the information should check the space provided.

___ No, I prefer not to provide this information

1. Gender ___ Female ___ Male
2. Which ONE of these categories best describes this person's ethnic/racial status?
   (If more than one applies, use the category that most closely reflects the person's recognition in the community.)

___ American Indian or Alaskan Native ___ Black, not of Hispanic Origin

___ Asian ___ Pacific Islander

___ Hispanic ___ White, not of Hispanic Origin

3. Does this person have a disability* which limits a major life activity?
___ Yes ___No

Definitions

American Indian or Alaskan Native: A person having origins in any of the original peoples of North America, and who maintains cultural identification through tribal affiliation or community recognition.

Asian: A person having origins in any of the original peoples of East Asia, Southeast Asia and the Indian subcontinent. This area includes for example, China, India, Indonesia, Japan, Korea and Vietnam.

Black, not of Hispanic origin: A person having origins in any of the black racial groups of Africa.

Pacific Islander: A person having origins in any of the original peoples of Hawaii; the US Pacific Territories of Guam, American Samoa, and the North American Marianas; the U.W. Trust Territory of Palau; the islands of Micronesia and Melanesia; and the Philippines.

White, not of Hispanic origin: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

*Disabled: A person having a physical or mental impairment that substantially limits one or more major life activities; who has a record of such impairment or who is regarded as having such impairment. (see Back)

Why this information is being requested:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity or disability of the nominee. To gather the information needed for this important task, you should submit a single copy of this form. However, submission of the requested information is not mandatory and is not a precondition of award.

Information from this form will be retained by Federal agencies as an integral part of their Privacy Act Systems of Records in accordance with the Privacy Act of 1974. These are confidential files accessible only to appropriate Federal agency personnel and will be treated as confidential to the extent permitted by law. Data submitted will be used in accordance with criteria established by the respective Federal agency for awarding grants for research and education, and in response to Public Law 99-383 and 42 USC 1885c.

FORM C-4

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES PURSUANT TO LOBBYING, DEBARMENT & SUSPENSION, NONDISCRIMINATION, AND DRUG-FREE WORKPLACE

1. LOBBYING

As required by Section 1352, Title 31 of the US Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates Agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $100,000, the applicant must certify that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(b) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, Disclosure Form to Report Lobbying, in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117 ó

A The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application / proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

B Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

The institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called Applicant, HEREBY AGREES THAT it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250)(hereinafter called NASA) issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives Federal financial assistance from NASA; and HEREBY GIVES ASSURANCE THAT it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, and transferee, for the period during which the real property or structure is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the Federal financial assistance is extended to it by NASA. THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the Applicant by NASA, including installment

payments after such date on account of applications for Federal financial assistance which were approved before such date. The applicant recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

FORM C-5

FAR 1999

Proposal Summary Form

1. Proposal Title:_____
2. Principal Investigator Name, Organization_____
3. Abstract of Proposed Research (200-300 words):

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Proposal Summary Form (continued)

4. NASA Installation individual who has expressed specific interest in this proposal (optional)
   Name_____
   Installation_____
   Telephone_____

5. Budget Summary by Federal Government Fiscal Year:

	YEAR 1	YEAR 2	YEAR 3
Requested NASA Funding			
Cost-Sharing (if applicable)			
Total Project Resources			

6. Major accomplishments planned by end of period of performance

FORM C-6

Institution Name:_____
Proposal Title:_____

FAR Budget Request Summary

From_____ to_____

	RECIPIENT'S COST A	NASA USE ONLY B	C
1. Direct Labor (salaries, wages, and fringe benefits)			
2. Other Direct Costs			
a. Subcontracts			
b. Consultants			
c. Equipment			
d. Supplies			
e. Travel			
f. Other			
3. Indirect Costs			
4. Other Applicable Costs			
5. SUBTOTAL - Estimated Costs			
6. Less Proposed Cost Sharing (if any)			
7. Carryover Funds (if any) a. Anticipated Amount _____ b. Amount used to reduce budget			
8. TOTAL ESTIMATED COST			xxxxxxxxxxxxx
APPROVED BUDGET	xxxxxxxxxxxxx	xxxxxxxxxxxxx	

Instructions

1. Provide a complete budget summary sheet for year one and separate estimates for each subsequent year.
2. Recipient's estimated costs should be entered in Column A. Columns B and C are for NASA use only. Column C represents the approved grant budget.
3. Provide as attachments detailed computations of estimates in each cost category with narratives required to fully explain proposed costs.

SPECIFIC COSTS

1. Direct Labor (salaries, wages, fringe benefits): Attachments should list number and titles of personnel, amount of time to be devoted to the grant, and rates of pa.
2. Other Direct Costs:
   a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting .
   b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expense and indirect costs).
   c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the grant officer. Any equipment purchase requested to be made as a direct charge under this grant must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
   d. Supplies: Provide general categories of needed supplies, the method of acquisition, estimated cost.
   e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
   f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate. Enter the student stipends (number of students x amount of stipend for each).
3. Indirect Costs: Identify indirect cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency and official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
4. Other Applicable Costs: Enter total of other applicable costs with an itemized list explaining the need for each item and basis for the estimate.
5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
7. Carryover Funds (if any): Enter the dollar amount of any funds that are expected to be available for carryover from the prior budget period. Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget. Not applicable to 2nd-year and subsequent-year budgets submitted f the award of a multiple year grant.
8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

Item (Descriptive name, probable brand, and model)	Quantity	Unit Price	Basis	Total Cost (Discounted)	Justification

Total Equipment _____

Non-NASA Contribution:_____

Cost to NASA: _____

(Use additional page(s) if needed.)